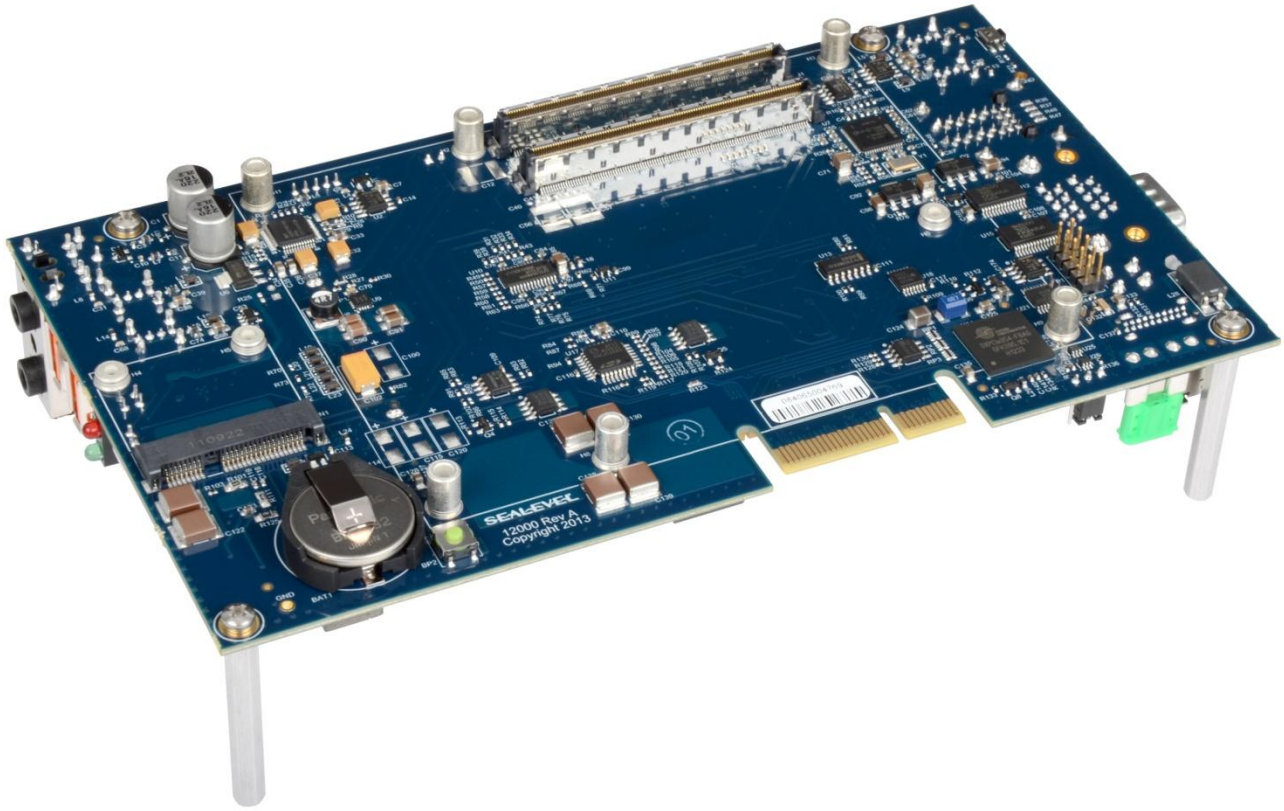
12000 COM Express Carrier Board

USER MANUAL



ITEM# 12000

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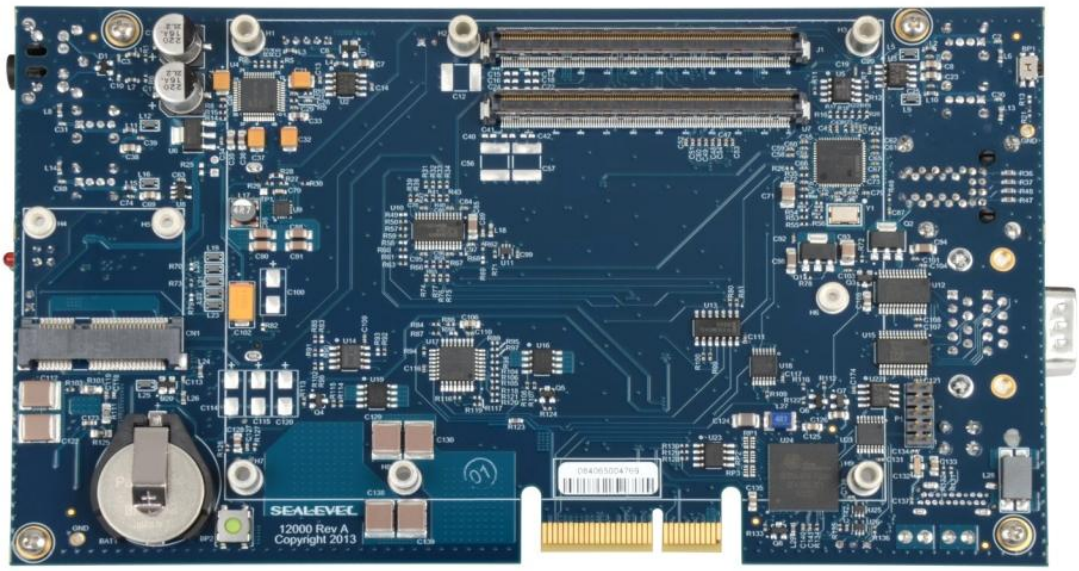
Introduction

COM Express is a widely supported implementation of Computer on Module (COM) design. The COM Express architecture reduces the complexity, cost and time required for custom computer system design by combining the processing, memory, video, Ethernet and USB functionality in a small, highly-integrated module. COM Express modules install on a carrier board that provides the application specific I/O and external connectors best suited for the system requirements.

Sealevel COM Express carrier boards leverage the company's years as a leader in I/O and communication products to provide carrier board and full system solutions in the fastest time possible. Common I/O features include serial, analog and digital I/O. Sealevel's extensive library of proven I/O circuits can be included as required to meet the specific I/O count, voltage ranges and connector types.

The 12000 is compatible with Basic and Compact form factor Type 6 pinout COM Express modules. The 12000 is based on the PICMG COM Express (COM.0 Rev. 2.0) specification and follows the PICMG COM Express Carrier Design Guide (CDG) where possible. (See 6.3 Carrier Board Design on page 12).

There are many features that make the 12000 stand out from other boards on the market such as the compact design, integrated EEPROM, next generation integrated UART and a high degree of customizability.



Features

The following features are included on the 12000 carrier board.

- 1 Display Port Compatible Video Output
- 2 Gigabit Ethernet Ports
- 2 RS-232 Serial Ports
- 1 RS-485 Serial Port
- 5 USB 2.0 Ports
- 1 Audio Line Input
- 1 Audio Line Output
- 256 Byte I2C EEPROM (with unique 128-bit serial number)
- Power and SATA Activity LED Indicators
- Reset Button
- PCI Express Mini Card Expansion (half-length only)
- Power Switch Input
- Accepts 2.5" SATA Disk Drive
- 18-36 VDC Input

Before You Get Started

WHAT'S INCLUDED

The 12000 carrier board is shipped with the following items. If any of these items are missing or damaged, please contact Sealevel for replacement.

- 12000 carrier board
- BK1043 SSD Mounting Bracket
- HW1191 Mylar Board Protector
- 10A Blade Fuse Installed
- CMOS Battery Installed

ADVISORY CONVENTIONS

Warning - The highest level of importance used to stress a condition where damage could result to the product or the user could suffer serious injury.

Important– The middle level of importance used to highlight information that might not seem obvious or a situation that could cause the product to fail.

Note – The lowest level of importance used to provide background information, additional tips, or other non-critical facts that will not affect the use of the product.

OPTIONAL ITEMS

Depending upon your application, you are likely to find one or more of the following items useful with the 12000. All items can be purchased from our website (www.sealevel.com) or by calling our sales team at (864) 843-4343.

AC/DC Power Supply (Item# TR140)

The TR140 is a desktop style power supply rated for 100-240VAC 50-60Hz input and 24VDC output at 2.7 amps. The latching Molex connector prevents accidental cable disconnection and unintended power interruption. The input socket accepts an IEC-320-C13 plug. Choose the appropriate input cord to use in other countries.

Solid State Drive (Item# SSD-32GMS)

The SSD-32GMS is a SATAII Solid State Drive featuring MLC NAND flash. Many more drives are available to find the correct match of capacity, durability and operating temperature range.

DB9 Female to DB9 Male Extension Cable, 72" Length (Item# CA127)

The CA127 is a standard DB9F to DB9M serial extension cable. Extend a DB9 cable or locate a piece of hardware where it is needed with this six foot (72) cable. The connectors are pinned one-to-one so the cable is compatible with any device or cable with DB9 connectors. The cable is fully shielded against interference and the connectors are molded to provide strain relief. Dual metal thumbscrews secure the cable connections and prevent accidental disconnection.

9 Female to DB25 Male Standard RS-232 Modem Cable, 72" Length (Item# CA177)

The CA177 is a standard AT-style RS-232 modem cable with a DB9 female connector on one end and a DB25 male connector on the other end. Simply connect the DB9 female connector to the DB9 serial port on the 12000 carrier board, and then connect the DB25 male connector to your RS-232 serial modem or other compatible RS-232 serial device. The six foot cable is fully shielded with dual thumbscrews at each connector. The molded connectors integrate strain relief to prevent damage to the cable or connectors. All DB9 modem control signals are implemented and the cable is pinned to EIA-232 standards.

10 Position to DB9 Male Adapter Cable (Item# CA152)

The CA152 provides a panel mount DB9 male connector for the 10 Position RS-485 connector on the 12000 carrier board.

TERMINAL BLOCKS

DB9 Female to 9 Screw Terminal Block (Item# TB05)

The TB05 terminal block breaks out a DB9 connector to 9 screw terminals to simplify field wiring of serial connections. It is ideal for RS-422 and RS-485 networks, yet it will work with any DB9 serial connection, including RS-232. The TB05 includes holes for board or panel mounting. The TB05 is designed to connect directly to the 12000 DB9 serial ports or any cable with a DB9M connector.

DB9 Female to 5 Screw Terminal Block (RS-422/485) (Item# TB34)

The TB34 terminal block adapter offers a simple solution for connecting RS-485 field wiring to the CA152 DB9 Male connector. The terminal block is compatible with 2-wire and 4-wire RS-485 networks.

Panel Mounted Adapter with Locking USB Port (Item# SL-PM)

The SL-PM easily adds a SeaLATCH locking USB port to your enclosure, faceplate or bulkhead. This gives you the freedom to add a locking USB port wherever it is needed.

Internal USB Cable for 2mm Molex Connectors, 14” (Item# CA471)

The CA471 is an embedded USB cable. One end has a 1x5 2mm Molex connector for connecting to the onboard latching USB header. The other end has a 1x4 2mm Molex connector for connecting to an SL-PM or a Sealevel embedded USB product. The CA471 is 14" in length.

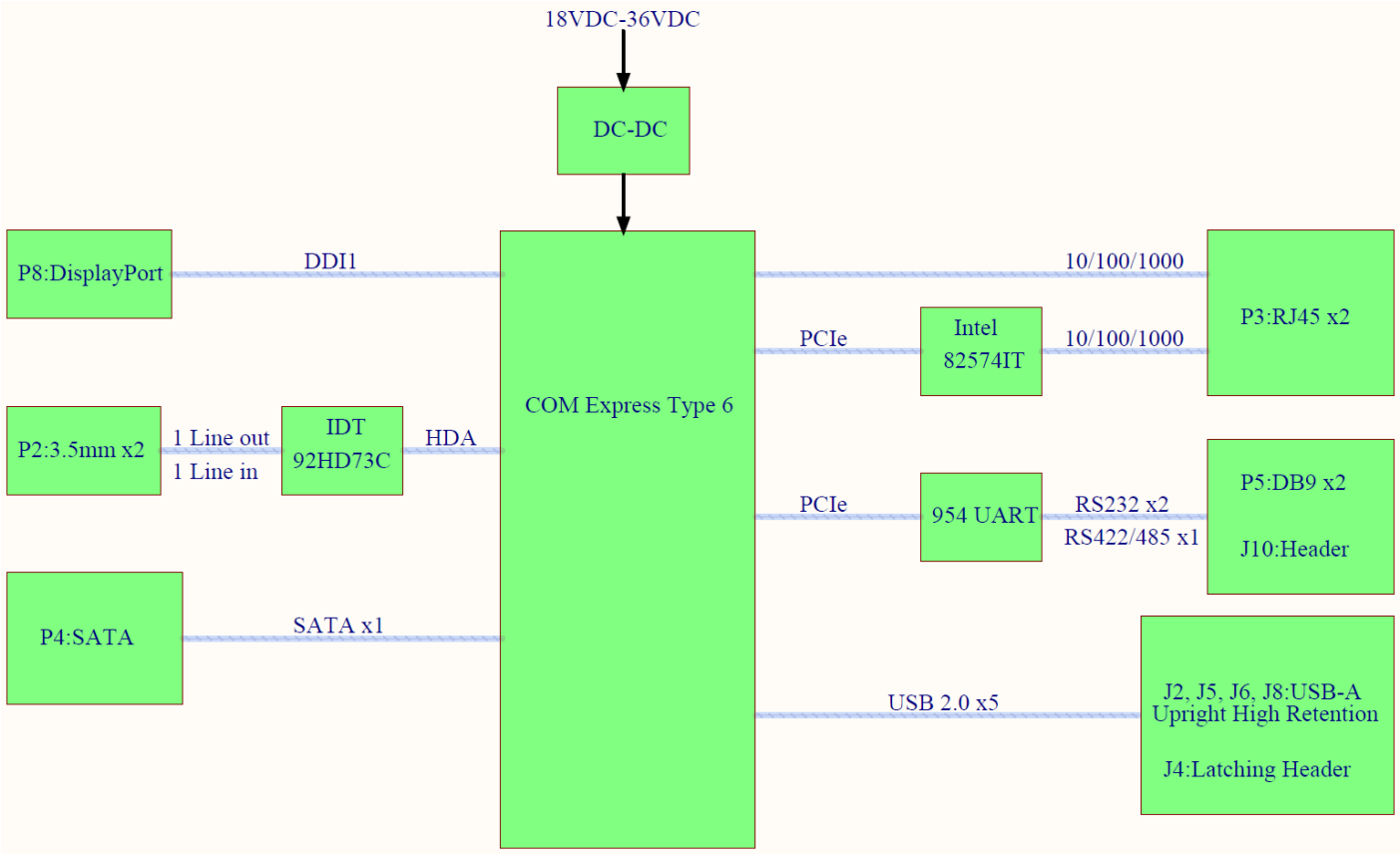
CAT5 Patch Cable, 7' in Length (Part# CA246)

Standard 7' CAT5 Unshielded Twisted Ethernet Pair Patch Cable (RJ45) with blue jacket.

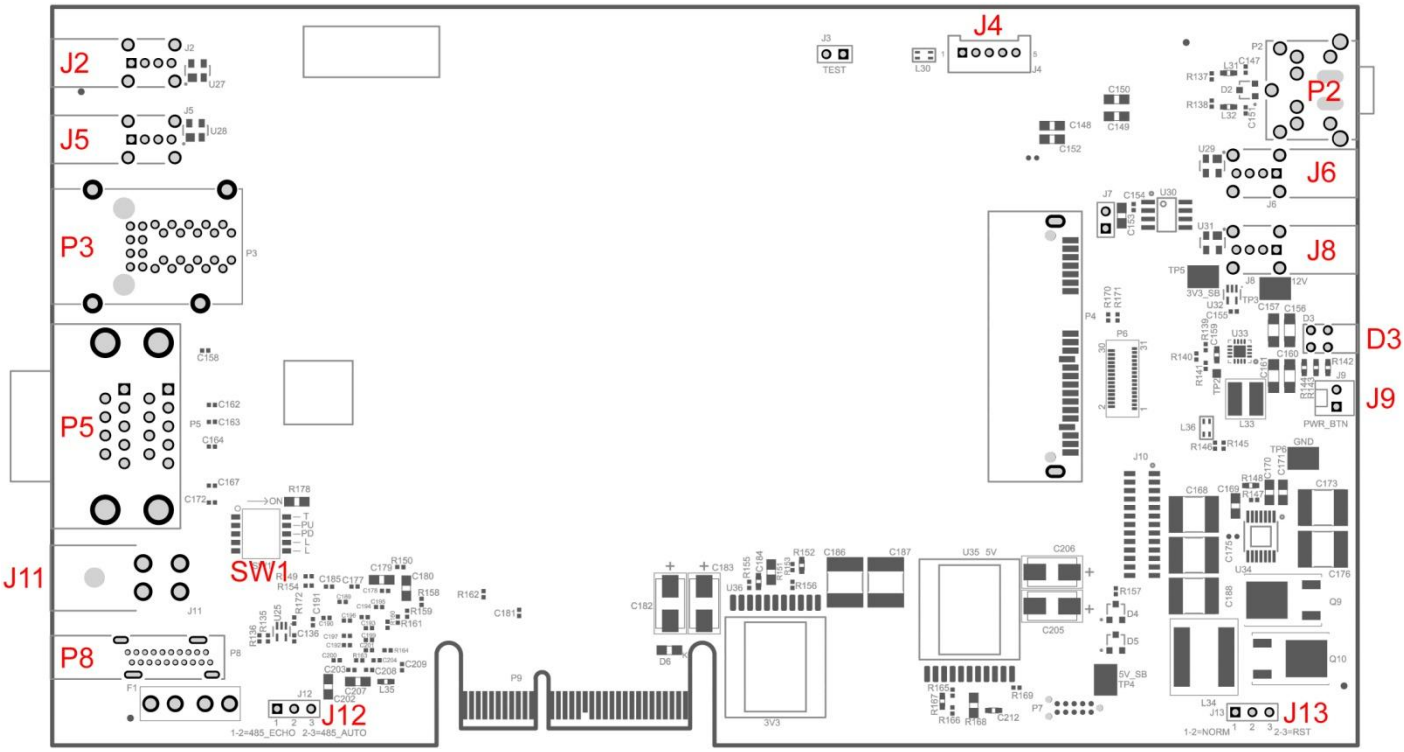
CAT5 Patch Cable, 10' in Length (Part# CA247)

Standard 10’ CAT5 Unshielded Twisted Pair Ethernet Patch Cable (RJ45) with blue jacket.

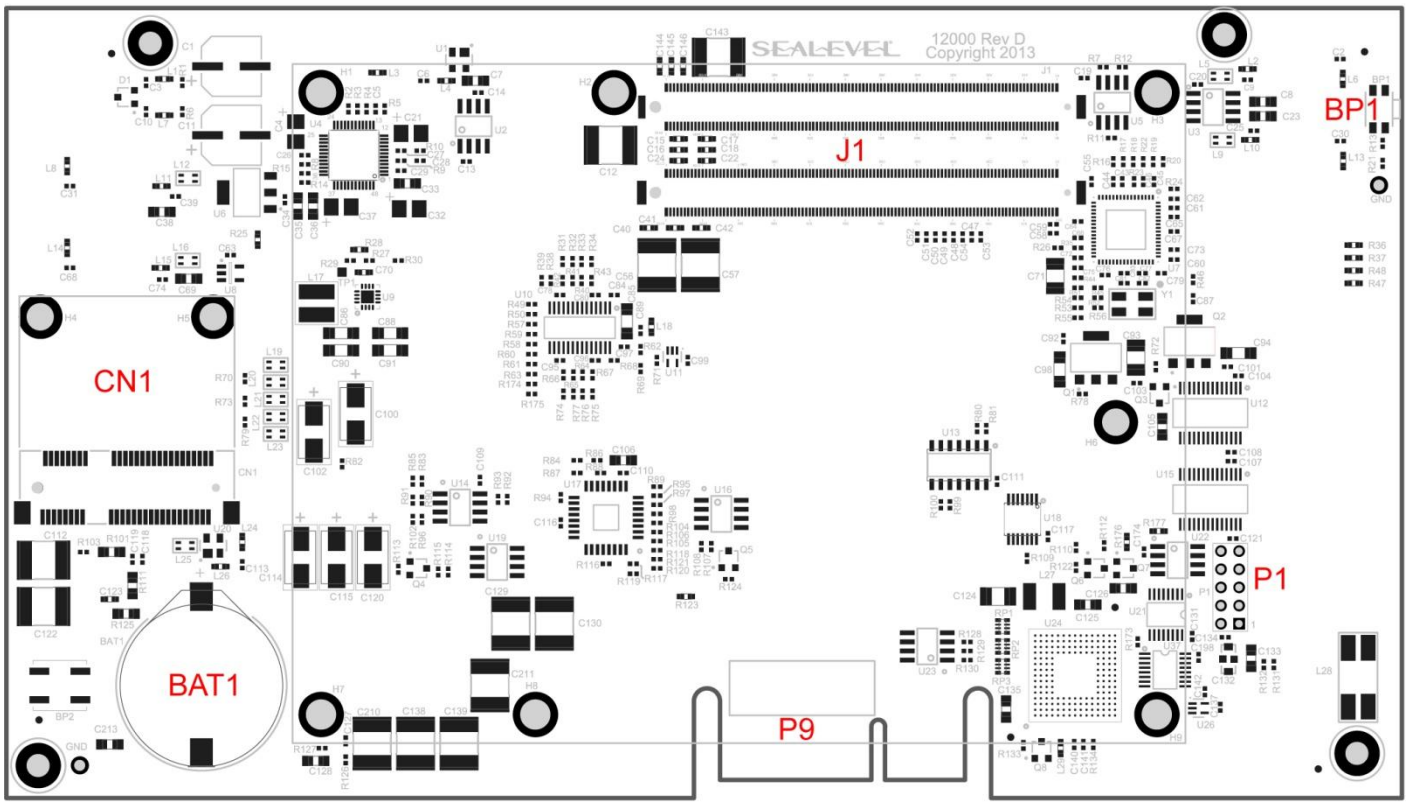
Function Block Diagram



Connector Layout

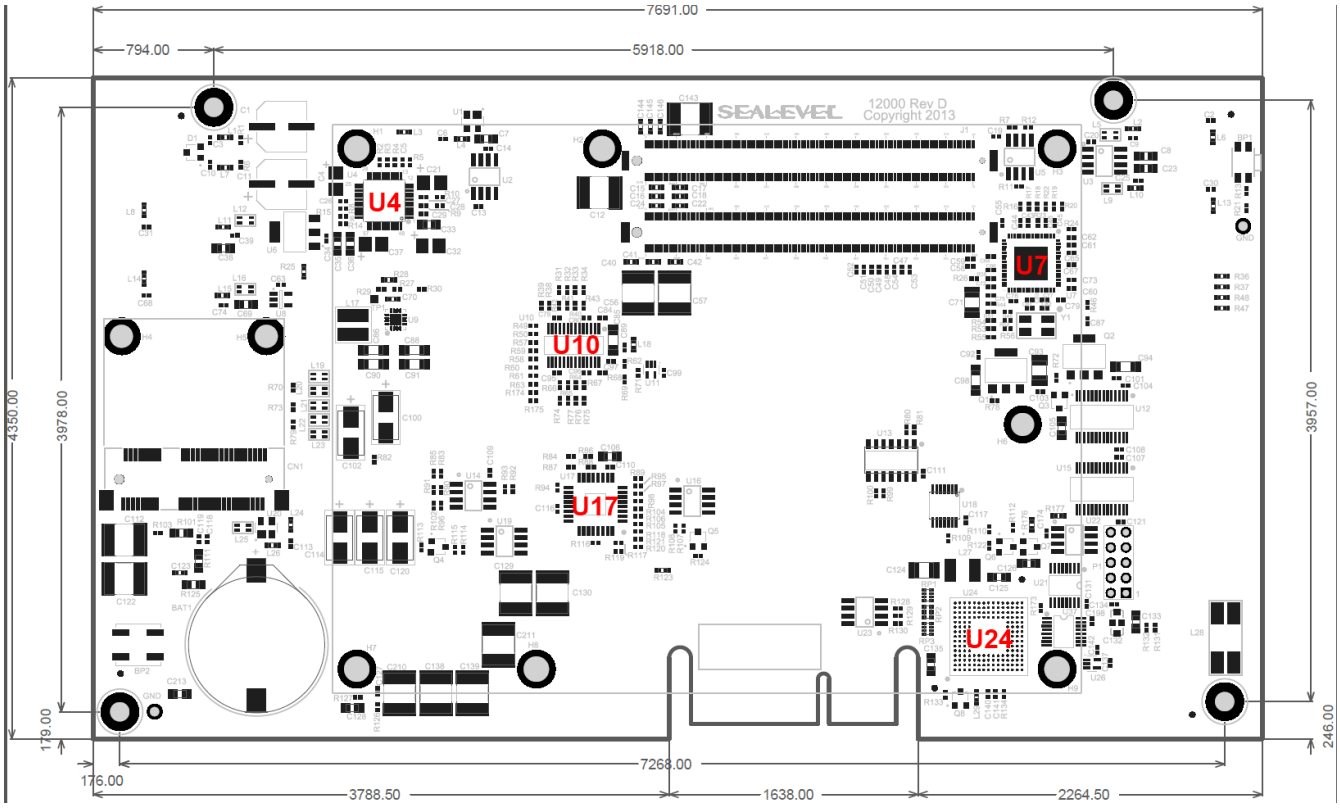


Reference Designator	Function
SW1	Serial Port 3 Termination Option Switch
J12	Serial Port 3 Mode Control Jumper
J13	CMOS Battery Backup Connection/Reset Jumper
J2, J5, J6, J8, J4	USB 2.0 Ports
P3	10/100/1000 LAN RJ45 x2 Connector
P5	Serial Ports DB9 x2 Connector
J11	DC Power Input Connector
P8	DisplayPort Connector
P2	Audio Connector
D3	Power/SATA Act Status LEDs
J9	Power Button Header



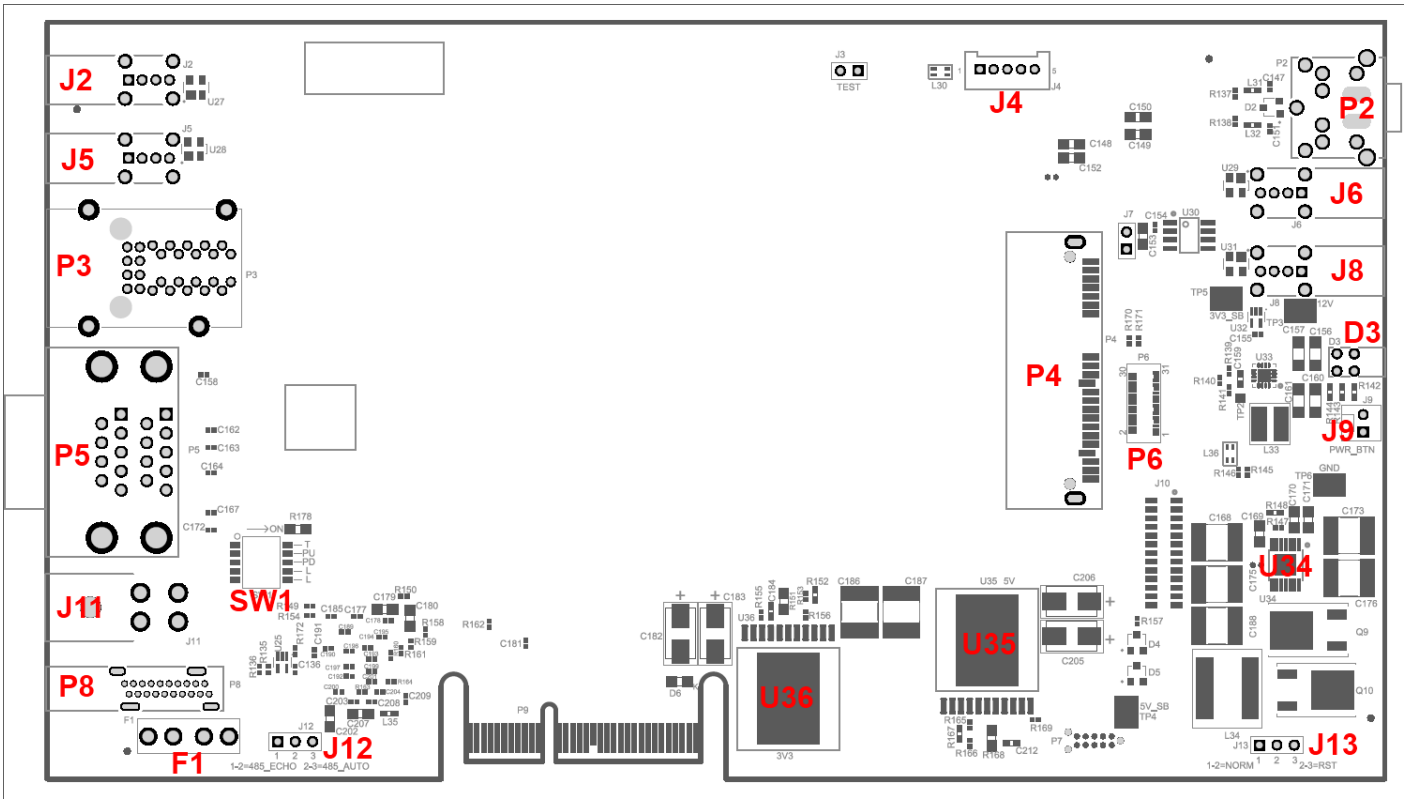
Reference Designator	Function
CN1	PCIe Mini Card
BAT1	RTC Backup Battery
J1	COM Express Connectors
P1	Serial Port 3 Header
BP1	Reset Button
P9	Proprietary Expansion Bus

Component Layout



Legend

Reference Designator	Function
U4	IDT 92HD73C Audio Codec
U7	Intel 82574IT PCIe Network Interface Controller
U10	IDT PCIe Clock Buffer
U17	Board Controller
U24	Oxford PCIe to Quad UART



Legend

Reference Designator	Function
U34	12V Power Supply Controller
U35	5V Power Supply
U36	3.3V Power Supply
SW1	Serial Port 3 Termination Option Switch
J12	Serial Port 3 Mode Control Jumper
J13	CMOS Battery Backup Connection/Reset Jumper
J2, J5, J6, J8, J4	USB 2.0 Ports
P3	RJ45 x2 Connector
P5	DB9 x2 Connector
J11	DC Power Input Connector
P8	DisplayPort Connector
P2	Audio Connector
D3	Power/SATA Act Status LEDs
J9	Power Button Header

Specifications

MECHANICAL DIMENSIONS

Board length	7.69 inches	(19.54 cm)
Board Width	4.35 inches	(11.05 cm)

ENVIRONMENTAL SPECIFICATIONS

Specification	Operating	Storage
Temperature Range	-40 to 85 ºC (-40 to 185 ºF) [1]	-40 to 105 ºC (-40 to 221 ºF)
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

POWER SUPPLY

Supply line	18 VDC-36VDC
Rating (Dependent on COM Express Module and input voltage and load)	375mA-2150mA

STATUS LEDS D3

A two position LED is present at location D3. The GREEN LED is on when 12V power supply is powering the COM Express module. The RED SATA Activity LED flashes when there is SATA activity.

[1] Temperature range is for the 12000 board and its components excluding COM Express module.

CMOS BATTERY

The 12000 includes a 3V DC type CR2032 battery that supplies the RTC and CMOS memory of the COM Express CPU module.

Danger of explosion if battery is incorrectly replaced – *Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.*

To fulfill the requirements of the EN 60950, the 12000 incorporates two current-limiting devices (resistor and diode) in the battery power supply path.

I2C EEPROM

An I2C EEPROM is present on the 12000 carrier board. The EEPROM is 2 kbit (256Bytes) and operates at 400 kHz. The contents of the EEPROM can be edited and read via a software API. This can be used storage of configuration information, serial numbers and used to verify system credentials for licensed software.

Connector Descriptions

The following I/O connectors use industry standard pin outs for maximum compatibility.

Reference Designator	Function	Connector Type
P8	Video Output	DisplayPort
P3	10/100/1000 (Gigabit Ethernet) Network Connections	RJ-45
P5	RS-232 Serial Ports	DB9 Male
J2	USB 2.0 Device	USB Type A
J5	USB 2.0 Device	USB Type A
J6	USB 2.0 Device	USB Type A
J8	USB 2.0 Device	USB Type A
P2	Audio Input/Output	3.5mm Stereo Headphone
CN1	PCIe Mini Card	PCIe Mini Card Edge
P4	SATA Disk Drive	22 Pin SATA

The following I/O connectors use non-standard pin outs. However, Sealevel Systems offers accessory cables that provide industry standard pin outs.

Reference Designator	Function	Accessory Cable	Terminating Connector
P1	RS-485 Serial Port	CA152	DB9
J4	USB 2.0 Device	CA471 + SL-PM	USB Type A
J9	Power Button Input	CA254	Momentary Switch

The following connectors are not intended for use in this product. Do not use.

J3
J10
P6
P9

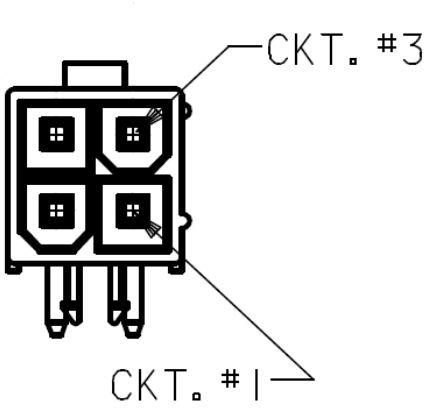
P9 is intended for Sealevel Systems internal use only. Several pins of P9 carry high DC voltages and provide direct electrical connection to the COM Express module and other ESD sensitive electronics. Extreme care should be taken to ensure no conductive materials come in contact with any pins of P9. Touching a conductive material to any contacts of P9 could result in irreparable damage to the circuit board and/or COM Express module. It is acceptable to place ESD safe tape over the contacts of P9 (on both sides of the circuit board) to provide protection from inadvertent damage.

The 12000-KT is shipped with the captive SATA drive pre-installed on the product. The aluminum-mounting bracket holds the drive on the board and a sheet of Mylar protects the circuit board from

damage due to small vibrations and movements of the disk drive. If the drive is removed or replaced for any reason, the protective Mylar sheet and disk drive bracket must be reinstalled.

POWER INPUT

The 12000 carrier board is designed to operate from 18VDC up to 36VDC. The current draw varies across this range and is heavily dependent on the COM Express module, peripheral devices and installed software. The connector at J11 is Molex PN 39-30-1040. Use Molex 39-01-2040 connector housing with Series 5556 Mini-Fit Jr crimp terminals.



CKT #	Signal	Name
1	+	Positive DC Power
2	+	Positive DC Power
3	-	Negative DC Power (GND)
4	-	Negative DC Power (GND)

MODULE TYPE 6 CONNECTOR PINOUT ROWS A AND B

(Signals shaded orange are not used)

Pin	Row A	Pin	Row B	Pin	Row A	Pin	Row B
A1	GND(FIXED)	B1	GND(FIXED)	A56	PCIE_TX4-	B56	PCIE_RX4-
A2	GBE0_MDI3-	B2	GBE0_ACT#	A57	GND	B57	GPO2
A3	GBE0_MDI3+	B3	LPC_FRAME#	A58	PCIE_TX3+	B58	PCIE_RX3+
A4	GBE0_LINK100#	B4	LPC_AD0	A59	PCIE_TX3-	B59	PCIE_RX3-
A5	GBE0_LINK1000#	B5	LPC_AD1	A60	GND(FIXED)	B60	GND(FIXED)
A6	GBE0_MDI2-	B6	LPC_AD2	A61	PCIE_TX2+	B61	PCIE_RX2+
A7	GBE0_MDI2+	B7	LPC_AD3	A62	PCIE_TX2-	B62	PCIE_RX2-
A8	GBE0_LINK#	B8	LPC_DRQ0#	A63	GPI1	B63	GPO3
A9	GBE0_MDI1-	B9	LPC_DRQ1#	A64	PCIE_TX1+	B64	PCIE_RX1+
A10	GBE0_MDI1+	B10	LPC_CLK	A65	PCIE_TX1-	B65	PCIE_RX1-
A11	GND(FIXED)	B11	GND(FIXED)	A66	GND	B66	WAKE0#
A12	GBE0_MDI0-	B12	PWRBTN#	A67	GPI2	B67	WAKE1#
A13	GBE0_MDI0+	B13	SMB_CK	A68	PCIE_TX0+	B68	PCIE_RX0+
A14	GBE0_CTREF	B14	SMB_DAT	A69	PCIE_TX0-	B69	PCIE_RX0-
A15	SUS_S3#	B15	SMB_ALERT#	A70	GND(FIXED)	B70	GND(FIXED)
A16	SATA0_TX+	B16	SATA1_TX+	A71	LVDS_A0+	B71	LVDS_B0+
A17	SATA0_TX-	B17	SATA1_TX-	A72	LVDS_A0-	B72	LVDS_B0-
A18	SUS_S4#	B18	SUS_STAT#	A73	LVDS_A1+	B73	LVDS_B1+
A19	SATA0_RX+	B19	SATA1_RX+	A74	LVDS_A1-	B74	LVDS_B1-
A20	SATA0_RX-	B20	SATA1_RX-	A75	LVDS_A2+	B75	LVDS_B2+
A21	GND(FIXED)	B21	GND(FIXED)	A76	LVDS_A2-	B76	LVDS_B2-
A22	SATA2_TX+	B22	SATA3_TX+	A77	LVDS_VDD_EN	B77	LVDS_B3+
A23	SATA2_TX-	B23	SATA3_TX-	A78	LVDS_A3+	B78	LVDS_B3-
A24	SUS_S5#	B24	PWR_OK	A79	LVDS_A3-	B79	LVDS_BKLT_EN
A25	SATA2_RX+	B25	SATA3_RX+	A80	GND(FIXED)	B80	GND(FIXED)
A26	SATA2_RX-	B26	SATA3_RX-	A81	LVDS_A_CK+	B81	LVDS_B_CK+
A27	BATLOW#	B27	WDT	A82	LVDS_A_CK-	B82	LVDS_B_CK-
A28	(S)ATA_ACT#	B28	AC/HDA_SDIN2	A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL
A29	AC/HDA_SYNC	B29	AC/HDA_SDIN1	A84	LVDS_I2C_DAT	B84	VCC_5V_SBY
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0	A85	GPI3	B85	VCC_5V_SBY
A31	GND(FIXED)	B31	GND(FIXED)	A86	RSVD	B86	VCC_5V_SBY
A32	AC/HDA_BITCLK	B32	SPKR	A87	RSVD	B87	VCC_5V_SBY
A33	AC/HDA_SDOUT	B33	I2C_CK	A88	PCIE_CLK_REF+	B88	BIOS_DIS1#
A34	BIOS_DIS0#	B34	I2C_DAT	A89	PCIE_CLK_REF-	B89	VGA_RED
A35	THRMTRIP#	B35	THRM#	A90	GND(FIXED)	B90	GND(FIXED)
A36	USB6-	B36	USB7-	A91	SPI_POWER	B91	VGA_GRN
A37	USB6+	B37	USB7+	A92	SPI_MISO	B92	VGA_BLU
A38	USB_6_7_OC#	B38	USB_4_5_OC#	A93	GPO0	B93	VGA_HSYNC
A39	USB4-	B39	USB5-	A94	SPI_CLK	B94	VGA_VSYNC
A40	USB4+	B40	USB5+	A95	SPI_MOSI	B95	VGA_I2C_CK
A41	GND(FIXED)	B41	GND(FIXED)	A96	TPM_PP	B96	VGA_I2C_DAT
A42	USB2-	B42	USB3-	A97	TYPE10#	B97	SPI_CS#
A43	USB2+	B43	USB3+	A98	SER0_TX	B98	RSVD
A44	USB_2_3_OC#	B44	USB_0_1_OC#	A99	SER0_RX	B99	RSVD
A45	USB0-	B45	USB1-	A100	GND(FIXED)	B100	GND(FIXED)
A46	USB0+	B46	USB1+	A101	SER1_TX	B101	FAN_PWMOUT
A47	VCC_RTC	B47	EXCD1_PERST#	A102	SER1_RX	B102	FAN_TACHIN
A48	EXCD0_PERST#	B48	EXCD1_CPPE#	A103	LID#	B103	SLEEP#
A49	EXCD0_CPPE#	B49	SYS_RESET#	A104	VCC_12V	B104	VCC_12V
A50	LPC_SERIRQ	B50	CB_RESET#	A105	VCC_12V	B105	VCC_12V
A51	GND(FIXED)	B51	GND(FIXED)	A106	VCC_12V	B106	VCC_12V
A52	PCIE_TX5+	B52	PCIE_RX5+	A107	VCC_12V	B107	VCC_12V
A53	PCIE_TX5-	B53	PCIE_RX5-	A108	VCC_12V	B108	VCC_12V
A54	GPI0	B54	GPO1	A109	VCC_12V	B109	VCC_12V
A55	PCIE_TX4+	B55	PCIE_RX4+	A110	GND(FIXED)	B110	GND(FIXED)

MODULE TYPE 6 CONNECTOR PINOUT ROWS C AND D

Pin	Row C	Pin	Row D	Pin	Row C	Pin	Row D
C1	GND(FIXED)	D1	GND(FIXED)	C56	PEG_RX1-	D56	PEG_TX1-
C2	GND	D2	GND	C57	TYPE1#	D57	TYPE2#
C3	USB_SSRX0-	D3	USB_SSTX0-	C58	PEG_RX2+	D58	PEG_TX2+
C4	USB_SSRX0+	D4	USB_SSTX0+	C59	PEG_RX2-	D59	PEG_TX2-
C5	GND	D5	GND	C60	GND(FIXED)	D60	GND(FIXED)
C6	USB_SSRX1-	D6	USB_SSTX1-	C61	PEG_RX3+	D61	PEG_TX3+
C7	USB_SSRX1+	D7	USB_SSTX1+	C62	PEG_RX3-	D62	PEG_TX3-
C8	GND	D8	GND	C63	RSVD	D63	RSVD
C9	USB_SSRX2-	D9	USB_SSTX2-	C64	RSVD	D64	RSVD
C10	USB_SSRX2+	D10	USB_SSTX2+	C65	PEG_RX4+	D65	PEG_TX4+
C11	GND(FIXED)	D11	GND(FIXED)	C66	PEG_RX4-	D66	PEG_TX4-
C12	USB_SSRX3-	D12	USB_SSTX3-	C67	RSVD	D67	GND
C13	USB_SSRX3+	D13	USB_SSTX3+	C68	PEG_RX5+	D68	PEG_TX5+
C14	GND	D14	GND	C69	PEG_RX5-	D69	PEG_TX5-
C15	DDI1_PAIR6+	D15	DDI1_CTRLCLK_AUX+	C70	GND(FIXED)	D70	GND(FIXED)
C16	DDI1_PAIR6-	D16	DDI1_CTRLDATA_AUX-	C71	PEG_RX6+	D71	PEG_TX6+
C17	RSVD	D17	RSVD	C72	PEG_RX6-	D72	PEG_TX6-
C18	RSVD	D18	RSVD	C73	GND	D73	GND
C19	PCIE_RX6+	D19	PCIE_TX6+	C74	PEG_RX7+	D74	PEG_TX7+
C20	PCIE_RX6-	D20	PCIE_TX6-	C75	PEG_RX7-	D75	PEG_TX7-
C21	GND(FIXED)	D21	GND(FIXED)	C76	GND	D76	GND
C22	PCIE_RX7+	D22	PCIE_TX7+	C77	RSVD	D77	RSVD
C23	PCIE_RX7-	D23	PCIE_TX7-	C78	PEG_RX8+	D78	PEG_TX8+
C24	DDI1_HPD	D24	RSVD	C79	PEG_RX8-	D79	PEG_TX8-
C25	DDI1_PAIR4 +	D25	RSVD	C80	GND(FIXED)	D80	GND(FIXED)
C26	DDI1_PAIR4-	D26	DDI1_PAIR0+	C81	PEG_RX9+	D81	PEG_TX9+
C27	RSVD	D27	DDI1_PAIR0-	C82	PEG_RX9-	D82	PEG_TX9-
C28	RSVD	D28	RSVD	C83	TPM_PP	D83	RSVD
C29	DDI1_PAIR5+	D29	DDI1_PAIR1+	C84	GND	D84	GND
C30	DDI1_PAIR5-	D30	DDI1_PAIR1-	C85	PEG_RX10+	D85	PEG_TX10+
C31	GND(FIXED)	D31	GND(FIXED)	C86	PEG_RX10-	D86	PEG_TX10-
C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAI12000+	C87	GND	D87	GND
C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAI12000-	C88	PEG_RX11+	D88	PEG_TX11+
C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL	C89	PEG_RX11-	D89	PEG_TX11-
C35	RSVD	D35	RSVD	C90	GND(FIXED)	D90	GND(FIXED)
C36	DDI3_CTRLCLK_AUX+	D36	DDI1_PAIR3+	C91	PEG_RX12+	D91	PEG_TX12+
C37	DDI3_CTRLDATA_AUX-	D37	DDI1_PAIR3-	C92	PEG_RX12-	D92	PEG_TX12-
C38	DDI3_DDC_AUX_SEL	D38	RSVD	C93	GND	D93	GND
C39	DDI3_PAIR0+	D39	DDI2_PAIR0+	C94	PEG_RX13+	D94	PEG_TX13+
C40	DDI3_PAIR0-	D40	DDI2_PAIR0-	C95	PEG_RX13-	D95	PEG_TX13-
C41	GND(FIXED)	D41	GND(FIXED)	C96	GND	D96	GND
C42	DDI3_PAIR1+	D42	DDI2_PAIR1+	C97	RSVD	D97	RSVD
C43	DDI3_PAIR1-	D43	DDI2_PAIR1-	C98	PEG_RX14+	D98	PEG_TX14+
C44	DDI3_HPD	D44	DDI2_HPD	C99	PEG_RX14-	D99	PEG_TX14-
C45	RSVD	D45	RSVD	C100	GND(FIXED)	D100	GND(FIXED)
C46	DDI3_PAI12000+	D46	DDI2_PAI12000+	C101	PEG_RX15+	D101	PEG_TX15+
C47	DDI3_PAI12000-	D47	DDI2_PAI12000-	C102	PEG_RX15-	D102	PEG_TX15-
C48	RSVD	D48	RSVD	C103	GND	D103	GND
C49	DDI3_PAIR3+	D49	DDI2_PAIR3+	C104	VCC_12V	D104	VCC_12V
C50	DDI3_PAIR3-	D50	DDI2_PAIR3-	C105	VCC_12V	D105	VCC_12V
C51	GND(FIXED)	D51	GND(FIXED)	C106	VCC_12V	D106	VCC_12V
C52	PEG_RX0+	D52	PEG_TX0+	C107	VCC_12V	D107	VCC_12V
C53	PEG_RX0-	D53	PEG_TX0-	C108	VCC_12V	D108	VCC_12V
C54	TYPE0#	D54	PEG_LANE_RV#	C109	VCC_12V	D109	VCC_12V
C55	PEG_RX1+	D55	PEG_TX1+	C110	GND(FIXED)	D110	GND(FIXED)

SUBSYSTEMS OF COM EXPRESS™ CONNECTOR ROWS A&B

HIGH PERFORMANCE SERIAL COMMUNICATION PORTS

The 12000 provides three high speed serial communication ports supporting data rates up to 921.6kbps. Ports 1 and 2 are RS-232 serial ports. Port 3 is an RS-485 port for communication with equipment up to 4000 ft. away from the computer or in noisy environments. The RS-485 2-wire mode is optimized for 'Multi-Drop' or 'Party-line' operations selecting data from multiple peripherals (as many as 31 devices can be connected on an RS-485 bus).

In RS-485 mode, our special auto-enable feature allows the RS485 ports to be viewed by the operating system as a COM: port. This allows the software application to utilize the serial port for RS485 communication without the need to control the direction of data between the master and slave device. Our on-board hardware automatically handles the RS-485 driver enabling.

Features of the serial ports include:

- 16C954 buffered UARTs with 128-byte FIFOs
- Software configurable clock prescaler and divisor support wide range of baud rates
- Supports 9-bit protocol framing
- Each port supports data rates to 921.6K bps
- All modem control signals implemented on RS-232 ports
- RS-485 line termination, pull-up and pull-down resistors are selectable via dipswitch on Port 3
- Automatic RS-485 enable/disable in hardware on Port 3
- Uses Sealevel's SeaCOM enhanced serial driver

SERIAL PORT SETUP

The 12000 Serial Ports are assigned I/O addresses and IRQs by the COM Express module BIOS or by a 'Plug-n-Play' Operating System.

CLOCK MODES

The 12000 Serial ports are implemented on a PCIe x1 lane and derive a 62.5 MHz clock from the PCI express link. The 62.5 MHz clock is divided by an 8 bit clock prescalar and a 16 bit clock divisor to provide a wide range of possible baud rates. Note that there are many combinations that can give the same result (e.g. Prescalar=1 and Divisor = 8, Prescalar =2 and Divisor = 4, or Prescalar=8 and Divisor = 1). As long as the calculated data rate is within +/- 2% you should communicate fine.

BAUD RATES

The following table shows some common data rates and the rates you should choose to achieve them when using the 12000 computer.

For This Data Rate	Clock Prescalar	Choose This Divisor DLM:DLL
1200 bps	3.625	898
2400 bps	3.625	449
4800 bps	1.875	434
9600 bps	1.875	217
19.2K bps	1.375	148
38.4K bps	1.375	74
57.6K bps	22.625	3
115.2K bps	1	34
230.4K bps	1	17
460.8K bps	2.125	4
921.6K bps	2.125	2

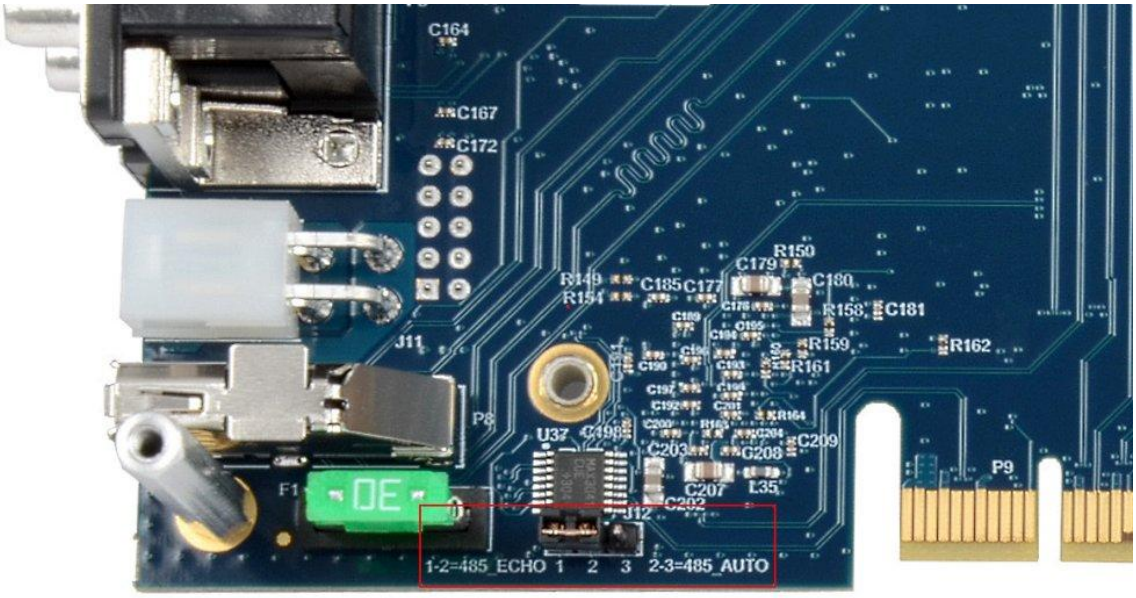
Many non-standard baud rates can be achieved by adjusting the Prescalar and Divisor. Contact Sealevel Systems Technical Support for assistance determining the correct parameters for your application.

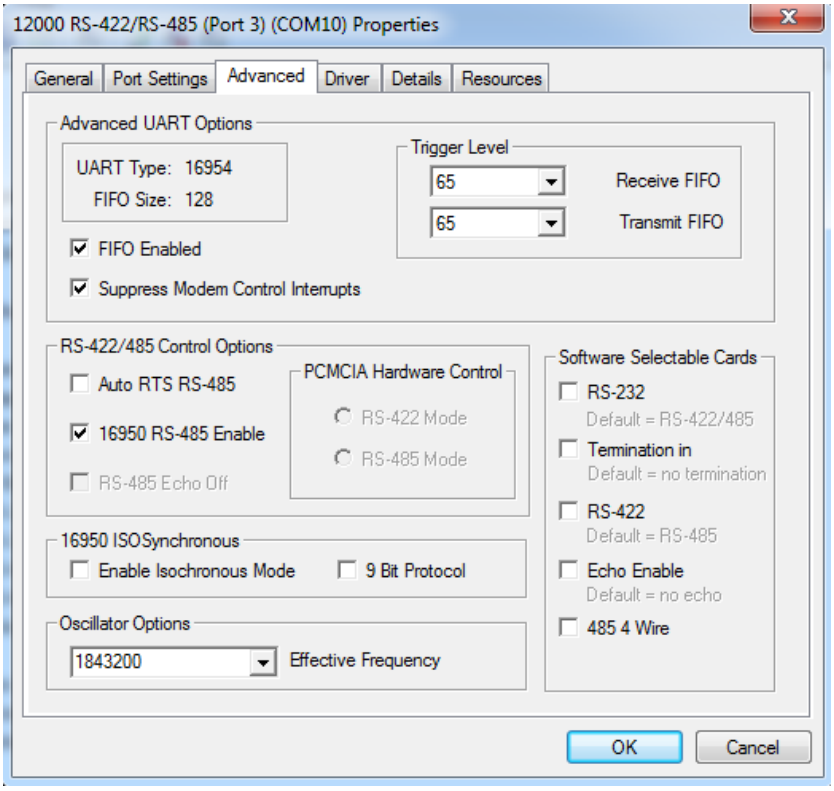
SERIAL PORT 3 OPERATION

Serial port 3 is the RS-485 serial port on the 12000 system.

For RS-485 half-duplex, no-echo mode, set the jumper on J12 to pins 2-3 and, in the Device Manager Port Properties Advanced tab, enable the "16950 RS-485 Enable" feature. The COM Express carrier board must be removed to access the J12 and SW1 to configure Port 3.

If the echo feature is required move the jumper on J12 to Pins 1-2.





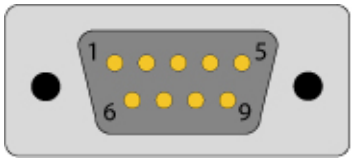
Typical settings for Serial Port 3 configuration options are shown below:

Setting Location	Pin	RS485 4 Wire	RS485 2 Wire
J12	N/A	Connect pins 2 and 3	Connect pins 2 and 3
SW1-1	T[2]	ON	ON
SW1-2	PU	ON	ON
SW1-3	PD	ON	ON
SW1-4	L	OFF	ON
SW1-5	L	OFF	ON

Switch	Name	Function
1	T	Adds or removes the 120 ohm termination.
2	PU	Adds or removes pull-up resistor in the RS-485 receiver circuit
3	PD	Adds or removes pull-down resistor in the RS-485 receiver circuit
4	L	Connects the TX+ to RX+ for RS-485 two-wire operation.
5	L	Connects the TX- to RX- for RS-485 two-wire operation.

[2] Termination, Pull-Up and Pull-Down may not be necessary depending on the equipment to which the R2 Port 3 is connecting.

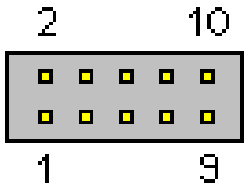
Serial Ports 1 and 2 are RS232 interface capable of data rates up to 921.6 kbps. These ports are available on 2 DB9 connectors on P5. Standard IEA-232 pin out is used. Port 1 is the DB9 connector closest to the PCB. Port 2 is the DB9 connector farthest from the PCB.



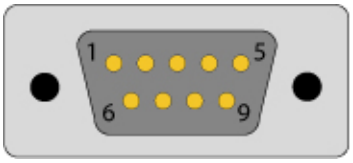
Pin #	Signal	Name	Mode
1	DCD	Data Carrier Detect	Input
2	RD	Receive Data	Input
3	TD	Transmit Data	Output
4	DTR	Data Terminal Ready	Output
5	GND	Ground	
6	DSR	Data Set Ready	Input
7	RTS	Request To Send	Output
8	CTS	Clear To Send	Input
9	RI	Ring Indicator	Input

Serial Port 3 is available on a 10 position .100" pitch 2x5 header. The CA152 cable pins out the IDC10 to a DB9 male header.

P10 Pin out



CA152 Pin out

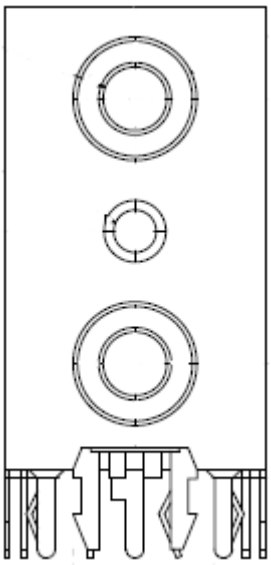


J10 Pin #	Signal	Name	Mode	DB9 Pin#
1	RX+	Receive Data +	Input	1
2	RTS+	Request To Send +	Output	6
3	RX-	Receive Data -	Input	2
4	RTS-	Request To Send -	Output	7
5	TX-	Transmit Data -	Output	3
6	CTS-	Clear To Send -	Input	8
7	TX+	Transmit Data +	Output	4
8	CTS+	Clear To Send +	Input	9
9	GND	Ground		5
10	NC	No Connect		NC

HDA AUDIO

The HD Audio is implemented with an IDT 92HD73C Codec and available on two 3.5mm Stereo Audio Jacks.

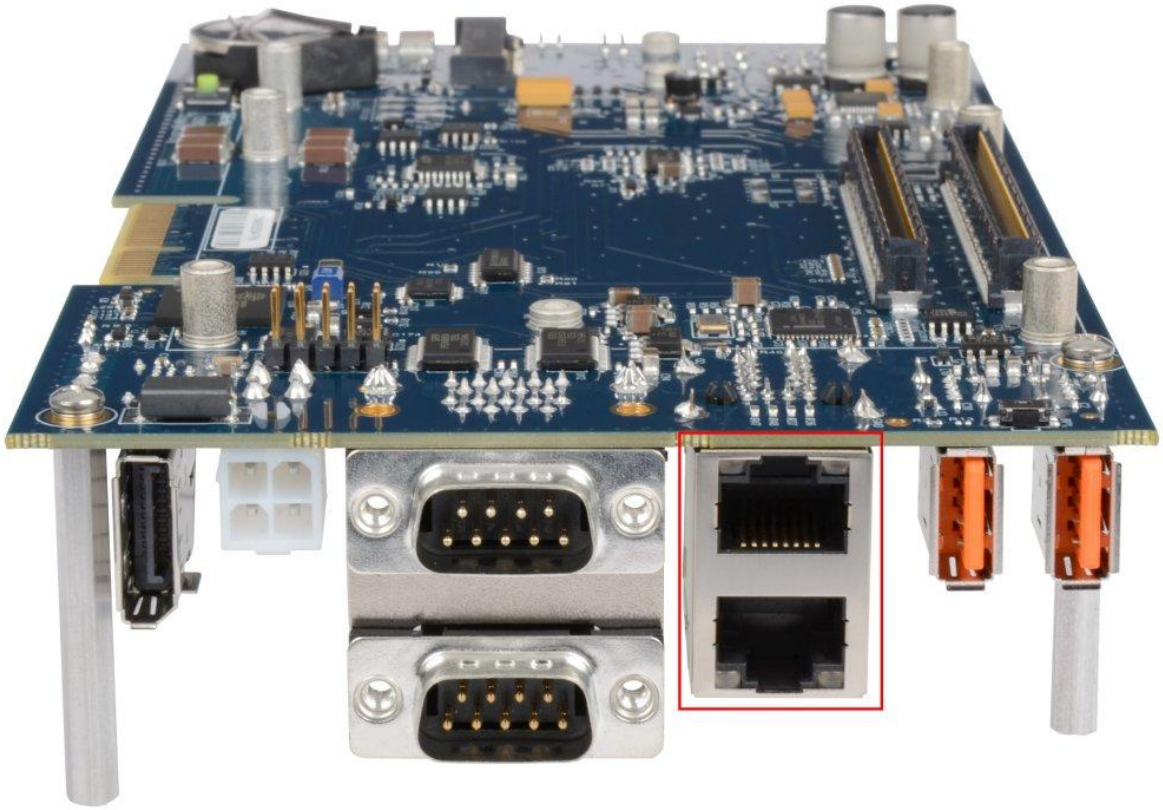
The Lower Jack (closest to the PCB) is Line level output. The Upper Jack (farthest from the PCB) is Line level input.



Upper/Lower	Contact	Name	Mode
Upper	Tip	Line In Left	Input
Upper	Ring	Line In Right	Input
Upper	Sleeve	Audio GND	Shield
Lower	Tip	Line Out Left	Output
Lower	Ring	Line Out Right	Output
Lower	Sleeve	Audio GND	Shield

LAN 10/100/1000

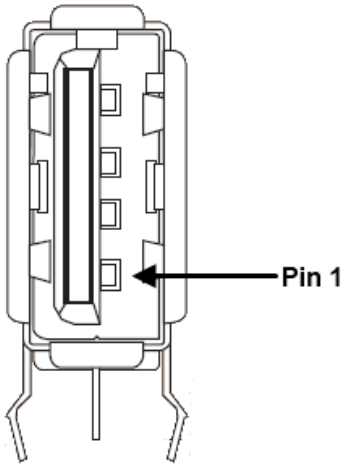
The 12000 carrier board contains 2 Gigabit Ethernet Ports at location P3. One is supported on all Type 6 COM Express modules. The second is implemented on the carrier board with PCIe x1 lane 0 of the COM express module. The Gigabit Ethernet Ports are terminated to a 2x1Dual RJ-45 connector with integrated magnetics. Each RJ-45 port contains 2 status LEDs. The lower RJ-45 connector on P3 is the port native to the COM express module, the upper port is the NIC implemented with PCIe on the carrier board. The left status LED is Green and the right status LED is Orange on both ports. On the upper port the Left/Green LED shows link status, while the right/Orange LED shows network activity. The use of the LEDs on the lower port is dependent on the COM Express module implementation.



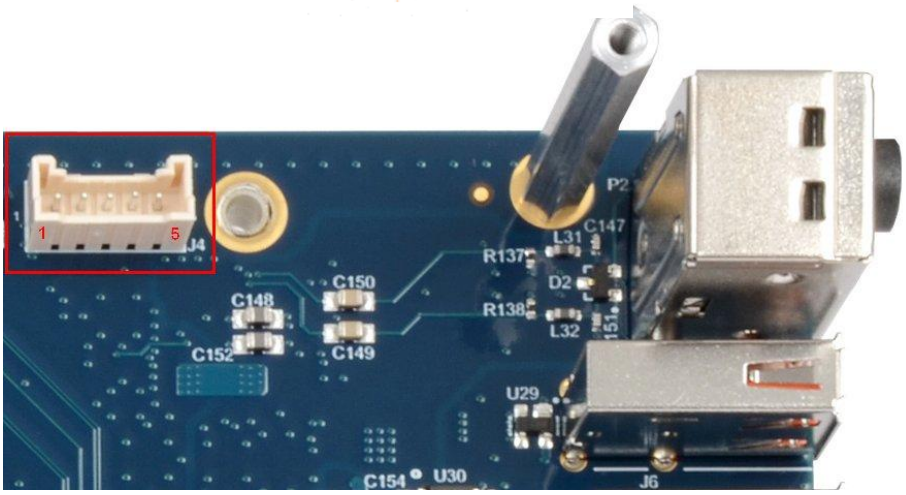
USB 2.0 PORTS

There are five USB 2.0 Ports available on the 12000 carrier board. Four are available at J2, J5, J6, and J8 as upright USB Type A high retention connectors (2 front, 2 rear). The fifth is available on J4 as a latching header (Molex PN 35362-0550).

Pin	Signal
1	+5V
2	Data-
3	Data+
4	USB_GND



Pin	Signal
1	+5V
2	Data-
3	Data+
4	USB_GND
5	Shield(CHS_GND)



SERIAL ATA™

One Serial ATA channel is available on a 22 position SATA DATA+POWER connector. It will accept any SATA compliant 2.5" disk drive. A protective Mylar sheet (included with the carrier board) ***must*** be used between the PCB and disk drive to protect the PCB from mechanical wear. This protective sheet is included with the product.

PCI EXPRESS® MINI CARD

A PCIe interface is implemented as a half-length PCI Express Mini Card slot at location CN1. Two M2 screws are required to install a PCIe Mini Card adapter. The slot includes PCIe and USB communication signals to support both electrical interfaces.

SUBSYSTEMS OF COM EXPRESS™ CONNECTOR ROWS C&D

DISPLAYPORT™

DDI1 of the COM Express Module is implemented on P8 with Display Port compatible signals. The connector has 3.3V present to power active DisplayPort to VGA or DisplayPort to DVI adapters.

Additional Features

POWER BUTTON INPUT

The 12000 carrier board features a two pin header (J9) for a momentary power switch. This input is read by the embedded board controller to mimic the power switch of an ATX power supply. Pin 1 of J9 is pulled up to 3.3 V. Shorting Pin 1 to Pin 2 (GND) signals the input. The default firmware has a 3 second delay before the power button signal is passed through to the COM Express module to signal power button press. This debounce delay should prevent accidental shutdown and can be modified with custom firmware. Contact Sealevel Systems Customer Support for configuration requests.

J9 is a 2 position .100" header intended to be used with a normally open momentary switch. The header is TE Connectivity PN 640456-2.

POWER STATES

The 12000 is designed to operate in 4 Power States as defined by ACPI.

S0 – Fully powered and operational

S3 – Suspended to memory (known as Sleep in Windows)

S4 – Suspended to disk (known as Hibernate in Windows)

S5 – Powered down in standby (Windows Shutdown)

The system can transition from S0 to any of the three listed standby states (S3, S4 or S5) by either software command or the Power Button signal on J9. The system can then be awoken from either listed sleep/standby state by holding J9 for 3 seconds. The system can also be awoken from S3 or S4 with a USB input device such as a HID compliant keyboard or mouse.

To be awoken from a standby state with a USB device, the device must be present when the computer enters the sleep state and must remain connected for the duration of the sleep state.

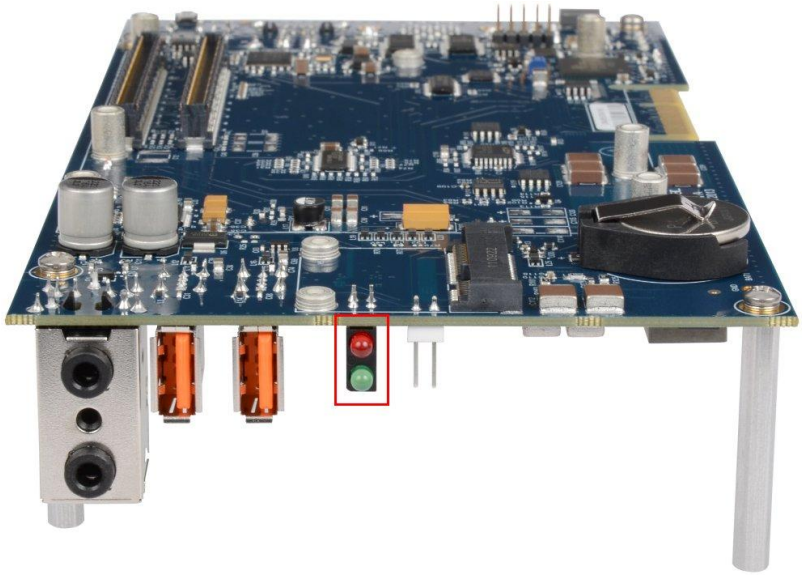
These power states are supported by Windows 8, Windows 7, Windows Vista, and Windows XP.

RESET BUTTON

A reset button is found at BP1 under the USB connectors. Holding this button for 1 second will reset the COM Express module. Reset of the COM Express module will in turn cause a board level reset of major chips and subsystems on the 12000 carrier board. The Reset Button delay is programmable with custom firmware on the 12000 Board Controller.

STATUS LEDS

Two status LEDs are found on the front of the circuit board at location D3. The upper/green LED is active when the 12 V power supply is powering the COM Express Module. This signifies that the COM Express module is powered. The lower/red LED shows SATA activity.



TEST POINTS

Test Points are available on the 12000 carrier board for the following power rails. These test points make it easier to connect oscilloscope probes and/or multimeter lines to ground when performing measurements on the COM Express™ module.

Ref Des	Signal
TP3	12V
TP4	5V_SB
TP5	3V3_SB
TP6	GND
GND	GND

Software Support

The 12000 carrier does not include a solid state drive or operating system. Several drive options are available from Sealevel Systems, but the system is designed to work with off-the-shelf SATA drives.

The 12000 can host both Windows and Linux operating systems. For Windows, you will need additional drivers to support the hardware. Some drivers apply to the hardware on the COM Express module; some are for devices present on the carrier board. The following table lists the devices that will require drivers.

Device	Location	Driver Source
Chipset	COM Express Module	COM Express Module Manufacturer
Integrated Graphics	COM Express Module	COM Express Module Manufacturer
Audio Interface	COM Express Module	COM Express Module Manufacturer
Network Connection 1	COM Express Module	COM Express Module Manufacturer
Network Connection 2	Carrier Board	Intel Website
Serial Ports	Carrier Board	Sealevel Website
I2C Bus	Carrier Board	Sealevel Website

WHERE TO GET SOFTWARE

All Sealevel products are shipped with media containing the installers for each software package available. If the media is otherwise unavailable or if desired, the current versions of Sealevel software packages can be obtained from the Sealevel website (see following instructions). If you already have the Sealevel software, proceed to the Windows or Linux installation section.

The following table provides the COM Express module manufacturers for the different modules available from Sealevel.

Model	Manufacturer	Vendor Website	Module Family
TCA/N2800	Congatec	www.congatec.com	Conga-TCA
IBR-i3-3217UE	ADlink	www.adlinktech.com	Express-IBR
IBR-i7-3517UE	ADlink	www.adlinktech.com	Express-IBR

The network adapter on the carrier board is implemented with an Intel 82574IT NIC on a PCIe x1 lane and provides (1) 10/100/1000 Mbps 802.3 compliant Ethernet connection. Install Intel's "Network Adapter Driver for Windows 7" driver (version 18.4). This can be found at https://downloadcenter.intel.com/.

Sealevel software drivers for this computer system can be found at the http://www.sealevel.com/support/article/AA-00584. Choose the link for the desired software package and click on the 'Download File' link to download the current driver.

- Install Sealevel's SeaCOM driver to use Serial Ports.

SEACOM WINDOWS INSTALLATION

To install Sealevel software, you must log in as an administrator or have administrator privileges.

1. When the InstallShield Wizard' window appears, click the 'Next' button to initiate the software installation.
2. When the 'License Agreement' window appears, accept the terms and click 'Next' to continue. You can click the 'Print' button to print out a copy of the agreement for your records. If you do not accept the terms of the agreement, the installation will stop.
3. When the 'Ready to Install the Program' window appears, click the 'Install' button to install the software onto the hard drive of your computer. The files will be automatically installed into the 'C:\Program Files' folder on your computer. Some versions of Windows will halt the installation and provide you with a dialog box which will ask you for permission for the installer to make changes to your computer. Click on the 'Allow' button to continue installation of your Sealevel software.

4. The following dialog box may appear, as shown below. Click the 'OK' button to continue.

SeaCOM - InstallShield Wizard
During installation, you may receive a warning indicating drivers being installed may not be certified by Microsoft's certification labs. If you receive this message you should click 'yes' to allow installation. All applications and drivers have been fully tested to maintain the integrity of your operating system.
OK

All Sealevel Systems software drivers have been fully tested by Sealevel. Clicking 'OK' will not harm your system.

5. The following dialog box may appear, as shown below. Click the 'OK' button to continue.

SeaCOM - InstallShield Wizard
If SeaCOM has previously been installed on this computer, you should go to the Device Manager and uninstall any SeaCOM cards. You should also reboot your computer before installing any card(s).
OK

This is a notification that if you are upgrading from a previous driver version, you should remove the associated Device Manager hardware entries and reinstall the adapter after the installing the SeaCOM software.

6. The setup file will automatically detect the operating environment and install the proper components. Next follow the information presented on the screens that follow. Once the installation is complete, close the disk installation window.
7. Refer to the Physical Installation section to connect and install your adapter.

UPGRADING TO THE CURRENT SEACOM DRIVER

1. Download the current driver using the Instructions from the Where to Get Software section above. Please take note of the destination directory it will save to.
2. Uninstall the currently loaded driver SeaCOM driver found in the Control Panel. In Windows 7 and later Oss, it will be found in the 'Programs and Features' list.
3. Navigate to the Device Manager and remove the Sealevel adapter by right clicking on the line item choosing 'Uninstall'. Depending on your product, it can be found under either 'Multiport Serial adapters' or 'Universal Serial Bus controllers'.
4. In the Device Manager under 'Action', choose 'Scan for Hardware changes'. This will prompt the installation of the adapter and associate it with the newly installed SeaCOM driver.

LINUX SUPPORT

The 12000 Serial Ports are supported natively in Linux kernels 2.6.28 and later.

Serviceable Parts

SERIAL PORT 3 CONFIGURATION

Serial Port 3 is configured as RS485 Half Duplex (2-Wire) No Echo.

Setting Location	Pin	RS485 Half Duplex
J12	N/A	Connect pins 2 and 3
SW1	T[3]	ON
SW1	PU	ON
SW1	PD	ON
SW1	L	ON
SW1	L	ON

INPUT CURRENT PROTECTION FUSE

The fuse holder located at location F1 is located on the positive power input path of the 12000 carrier board. To protect the user and the computer system from major system faults, the system is designed to have the fuse fail if DC current of 30A or greater is present.

The 12000 carrier board uses an automotive style Mini-Blade Fuse (Littlefuse PN 0997030.WXN).

To replace the fuse:

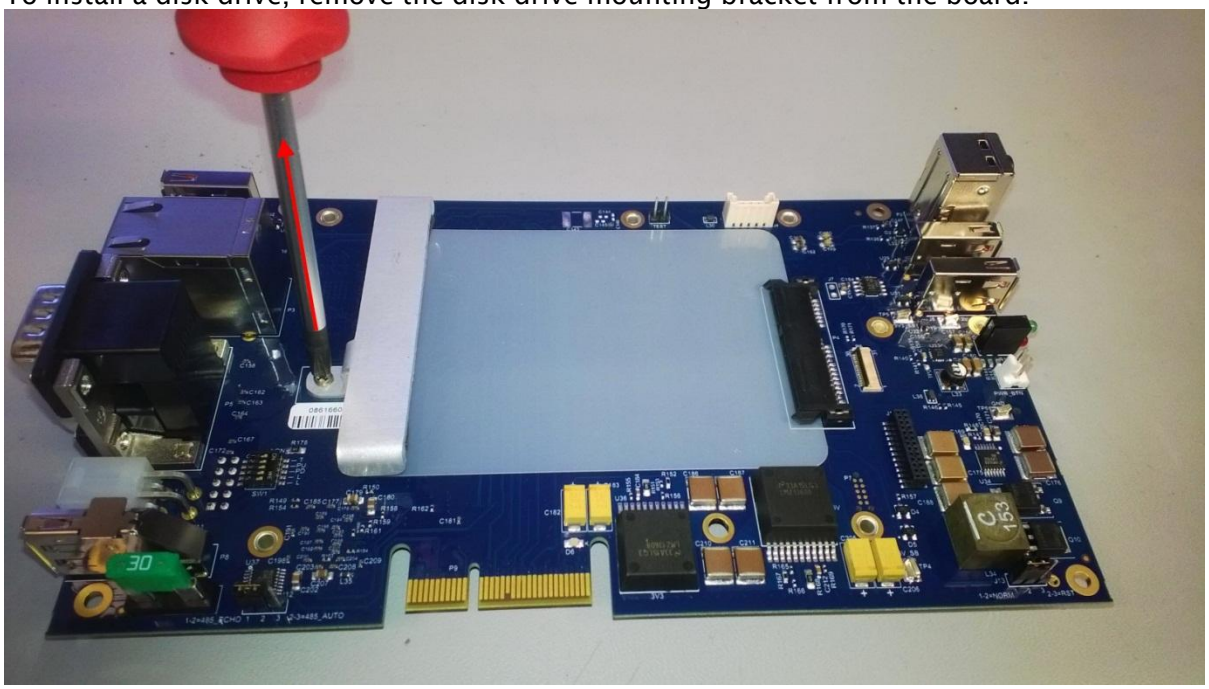
1. Grip the fuse and wiggle it back and forth while pulling up until the fuse slides out of the holder.
2. Place the blades of the new fuse in the holder and press it straight down into the holder until the blades are completely hidden by the fuse holder contacts.

Support the circuit board underneath the fuse holder while removing or installing the fuse.

[3] Termination, Pull-Up and Pull-Down may not be necessary depending on the equipment which the 12000 is connecting.

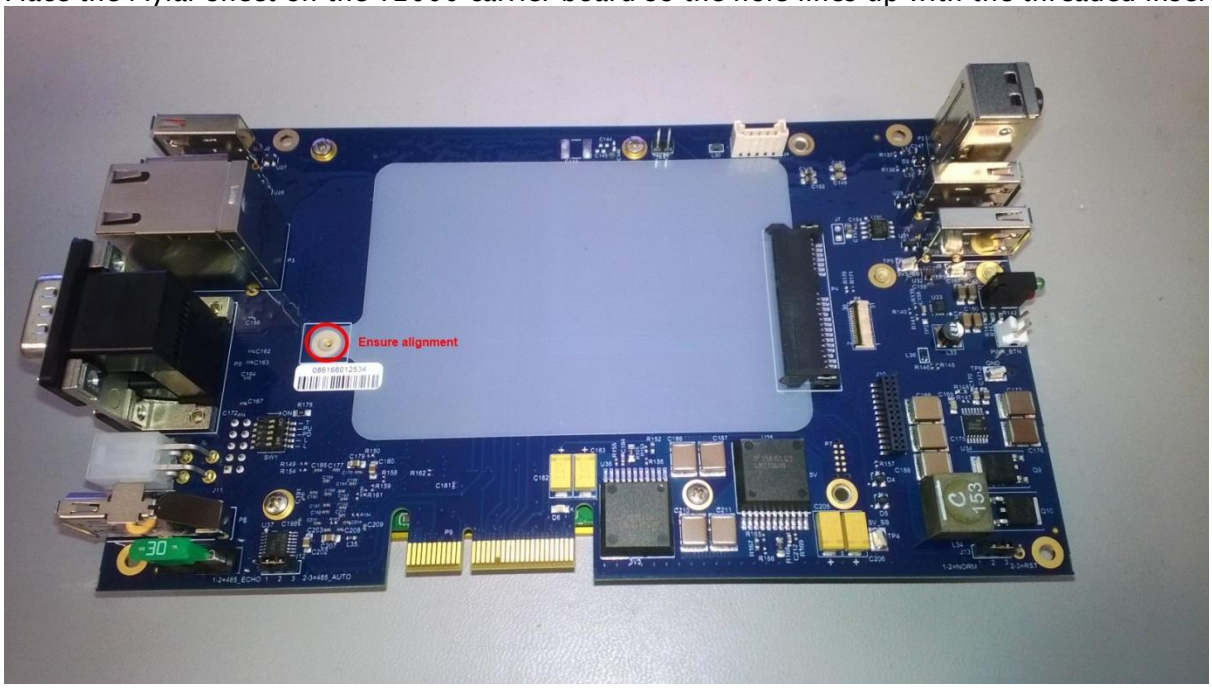
DISK DRIVE INSTALLATION

1. To install a disk drive, remove the disk drive mounting bracket from the board.

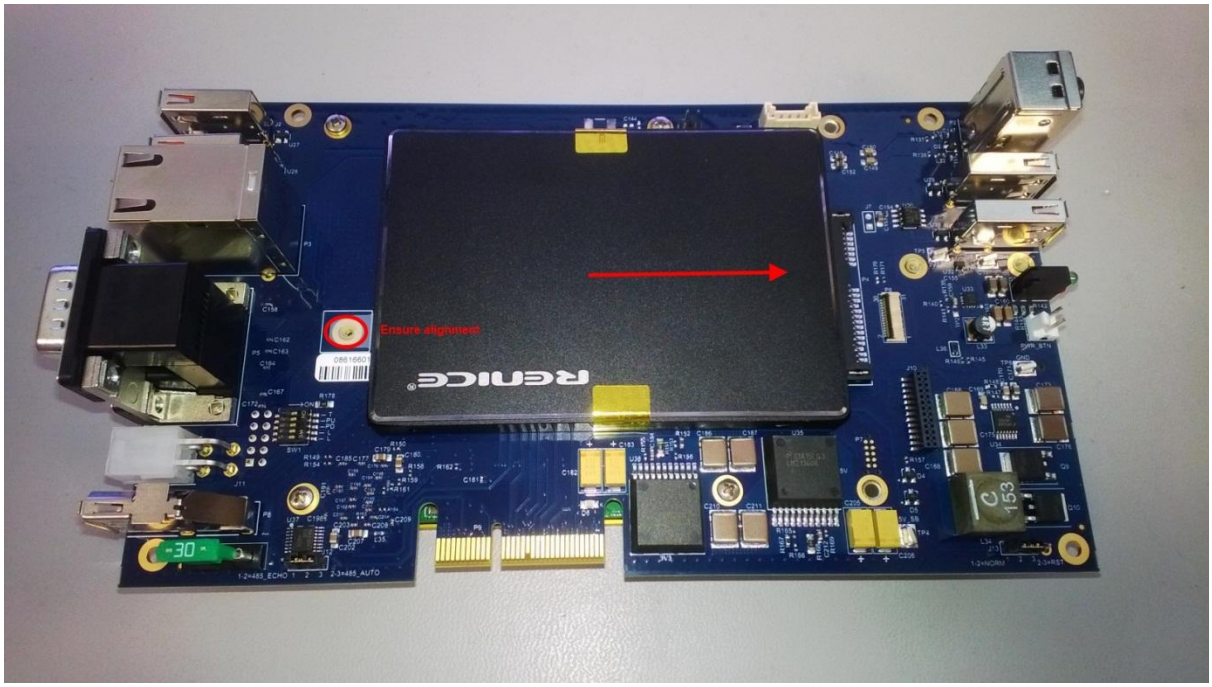


Ensure the protective Mylar sheet remains with the 12000 carrier board. It must be used to reinstall the drive.

2. Place the Mylar sheet on the 12000 carrier board so the hole lines up with the threaded insert.



3. Place the drive flat on the sheet and slide it backwards until it is fully seated on the board mount SATA connector.



Ensure the hole in the Mylar sheet is still aligned with the threaded insert in the board.

4. Place the SATA drive mounting bracket over the end of the disk drive and install the screw in the threaded insert in the 12000 carrier board.

For optimal reliability, apply a small amount of Loctite 242 Medium Strength threadlocker to the threads of the screw. Torque the screw between 3 and 4 in-lbs.

If the screw is lost, it should be replaced with a M2 x 6mm screw with 0.4mm thread pitch.

COM EXPRESS MODULE INSTALLATION

Verify that your Type 6 COM Express module meets the COM.0 R2.0 specification.

The 12000 board has mounting provisions to accept both Compact and Basic COM Express modules. No modification is necessary for use with a Compact module.

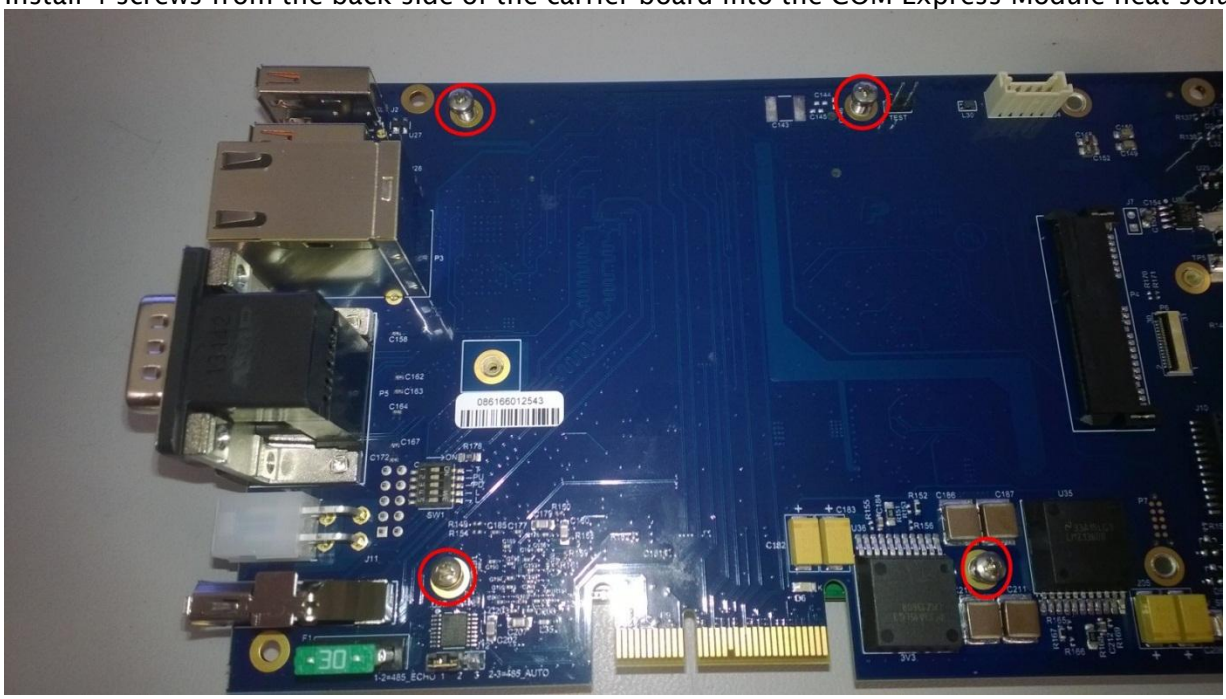
One standoff will likely need to be removed to install a Basic Size COM Express module.

A heat sink or heat spreader must be installed on the COM Express module prior to installation on the 12000 carrier board.

Installation of a COM Express module:

1. Place the module on the carrier board so the COM Express connectors and 4 mounting holes line up.
2. Evenly and firmly press the module onto the carrier board until both connectors fully seat.

3. Install 4 screws from the back side of the carrier board into the COM Express Module heat solution.

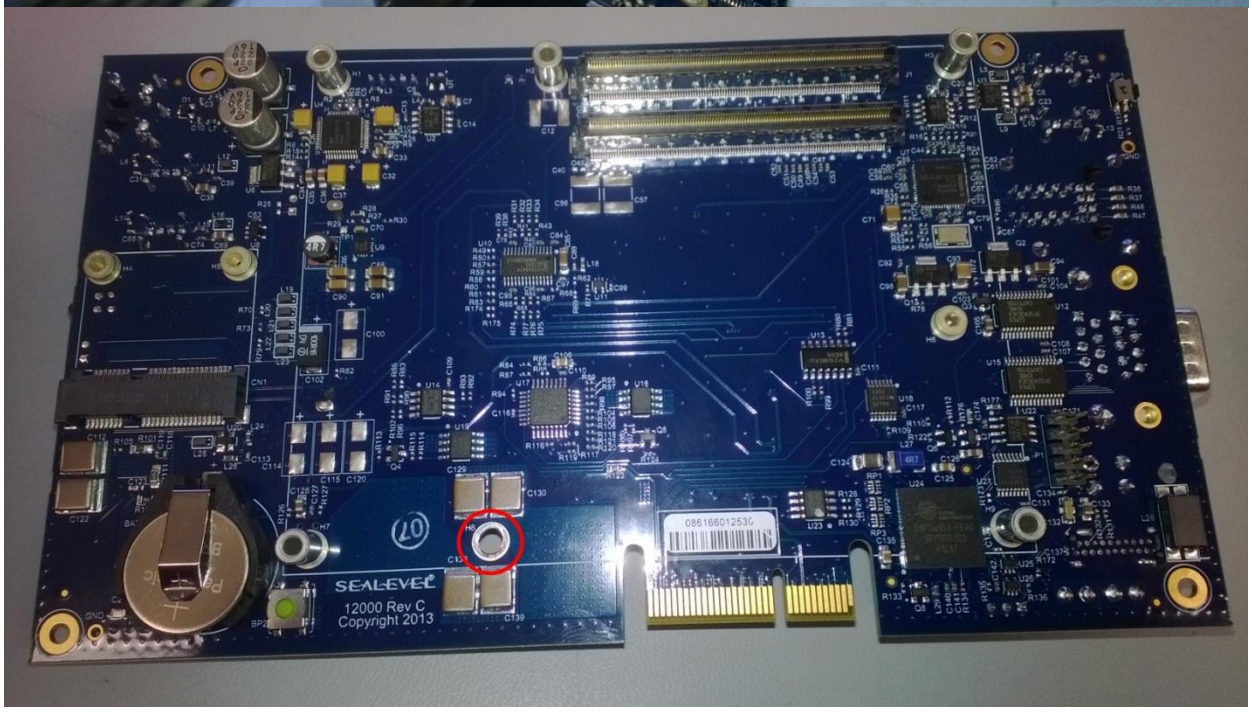


Depending on the heat solution, screws and nuts may be required to fasten the module to the carrier board.

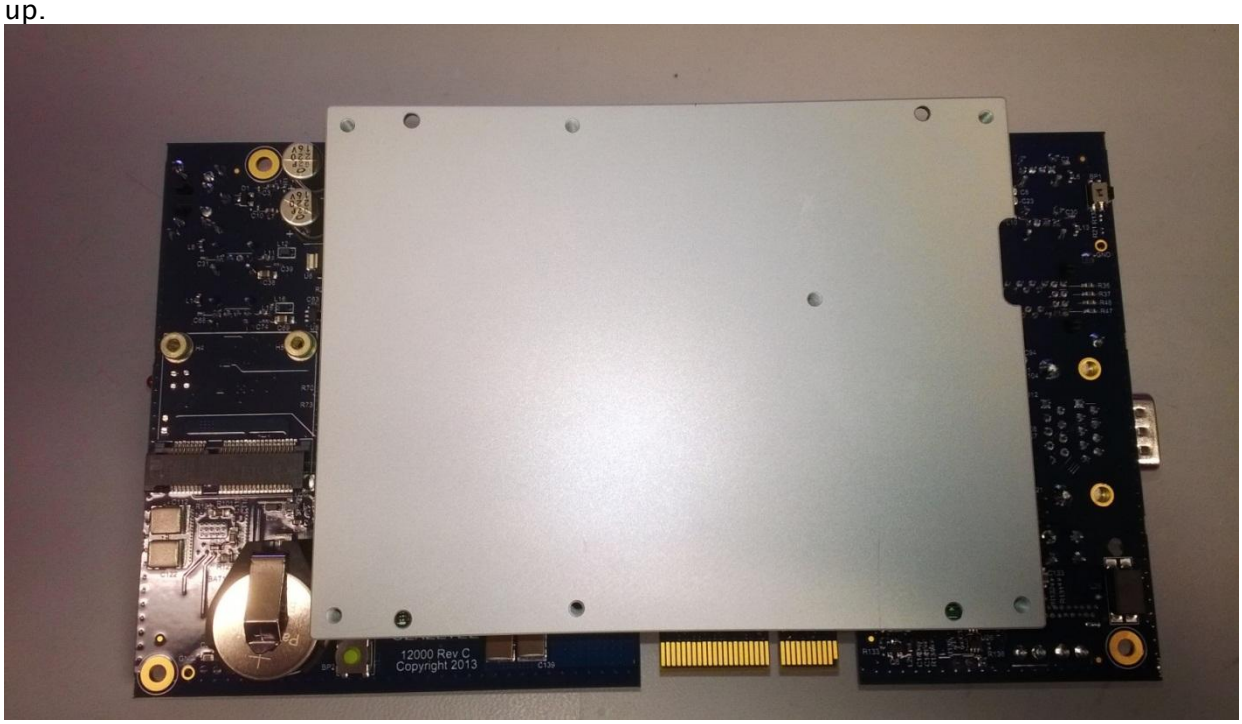
Installation of a Basic size module:

1. Remove the standoff shown by pressing a large soldering iron in the standoff from the back side of the carrier board. The standoff should loosen and press through after about 5 seconds.

Use tweezers or pliers to remove the standoff from the soldering iron. The standoff will be very hot!!!



2. Place the module on the carrier board so the COM Express connectors and 5 mounting holes line up.



3. Evenly and firmly press the module onto the carrier board until both connectors fully seat.
4. Install 5 screws from the back side of the carrier board into the COM Express Module heat solution.

Depending on the heat solution, screws and nuts may be required to fasten the module to the carrier board.

Appendix A - Handling Instructions

ESD Warnings

Electrostatic Discharges (ESD)

- A sudden electrostatic discharge can destroy sensitive components. Proper packaging and grounding rules must therefore be observed. Always take the following precautions: Transport boards and cards in electrostatically secure containers or bags.
- Keep electrostatically sensitive components in their containers, until they arrive at an electrostatically protected workplace.
- Only touch electrostatically sensitive components when you are properly grounded.
- Store electrostatically sensitive components in protective packaging or on anti-static mats.

Grounding Methods

The following measures help to avoid electrostatic damages to the device:

- Cover workstations with approved antistatic material. Always wear a wrist strap connected to a properly grounded workplace.
- Use antistatic mats, heel straps, and/or air ionizers for more protection.
- Always handle electrostatically sensitive components by their edge or by their casing.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting and removing connectors or connecting test equipment.
- Keep work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuum cleaners that are conductive.

Appendix B – Electrical Interface

RS-232

Quite possibly the most widely used communication standard is RS-232. This implementation has been defined and revised several times and is often referred to as RS-232 or EIA/TIA-232. The IBM PC computer defined the RS-232 port on a 9-pin D-sub connector, and subsequently, the EIA/TIA approved this implementation as the EIA/TIA-574 standard. This standard is defined as the 9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange. Both implementations are in widespread use and will be referred to as RS-232 in this document. RS-232 is capable of operating at data rates up to 20K bps at distances less than 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 is a single-ended or unbalanced interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logic states. The RS-232 and the EIA/TIA-574 specification define two types of interface circuits: Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE).

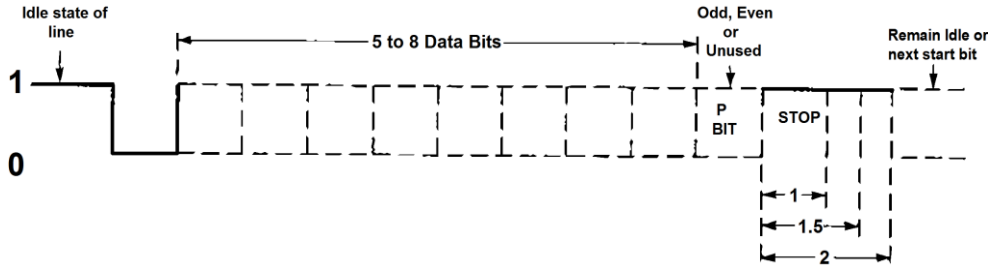
RS-485

RS-485 is backwardly compatible with RS-422; however, it is optimized for partyline or multi-drop applications. The output of the RS-485 driver is capable of being Active (enabled) or Tri-State (disabled). This capability allows multiple ports to be connected in a multi-drop bus and selectively polled. RS-485 allows cable lengths up to 4000 feet and data rates up to 10 Megabits per second. The signal levels for RS-485 are the same as those defined by RS-422. RS-485 has electrical characteristics that allow for 32 drivers and 32 receivers to be connected to one line. This interface is ideal for multi-drop or network environments. RS-485 tri-state driver (not dual-state) will allow the electrical presence of the driver to be removed from the line. Only one driver may be active at a time and the other driver(s) must be tri-stated. RS-485 can be cabled in two ways, two wire and four wire mode. Two wire mode does not allow for full duplex communication, and requires that data be transferred in only one direction at a time. For half-duplex operation, the two transmit pins should be connected to the two receive pins (Tx+ to Rx+ and Tx- to Rx-). Four wire mode allows full duplex data transfers. RS-485 does not define a connector pin-out or a set of modem control signals. RS-485 does not define a physical connector.

Appendix C – Asynchronous Communications

Serial data communications implies that individual bits of a character are transmitted consecutively to a receiver that assembles the bits back into a character. Data rate, error checking, handshaking, and character framing (start/stop bits) are pre-defined and must correspond at both the transmitting and receiving ends.

Asynchronous communications are the standard means of serial data communication for PC compatible and PS/2 computers. The original PC was equipped with a communication or COM port that was designed around an 8250 Universal Asynchronous Receiver Transmitter (UART). This device allows asynchronous serial data to be transferred through a simple and straightforward programming interface. A starting bit followed by a pre-defined number of data bits (5, 6, 7, or 8) defines character boundaries for asynchronous communications. The end of the character is defined by the transmission of a pre-defined number of stop bits (usually 1, 1.5 or 2). An extra bit used for error detection is often appended before the stop bits. The diagram below demonstrates asynchronous communication bits.

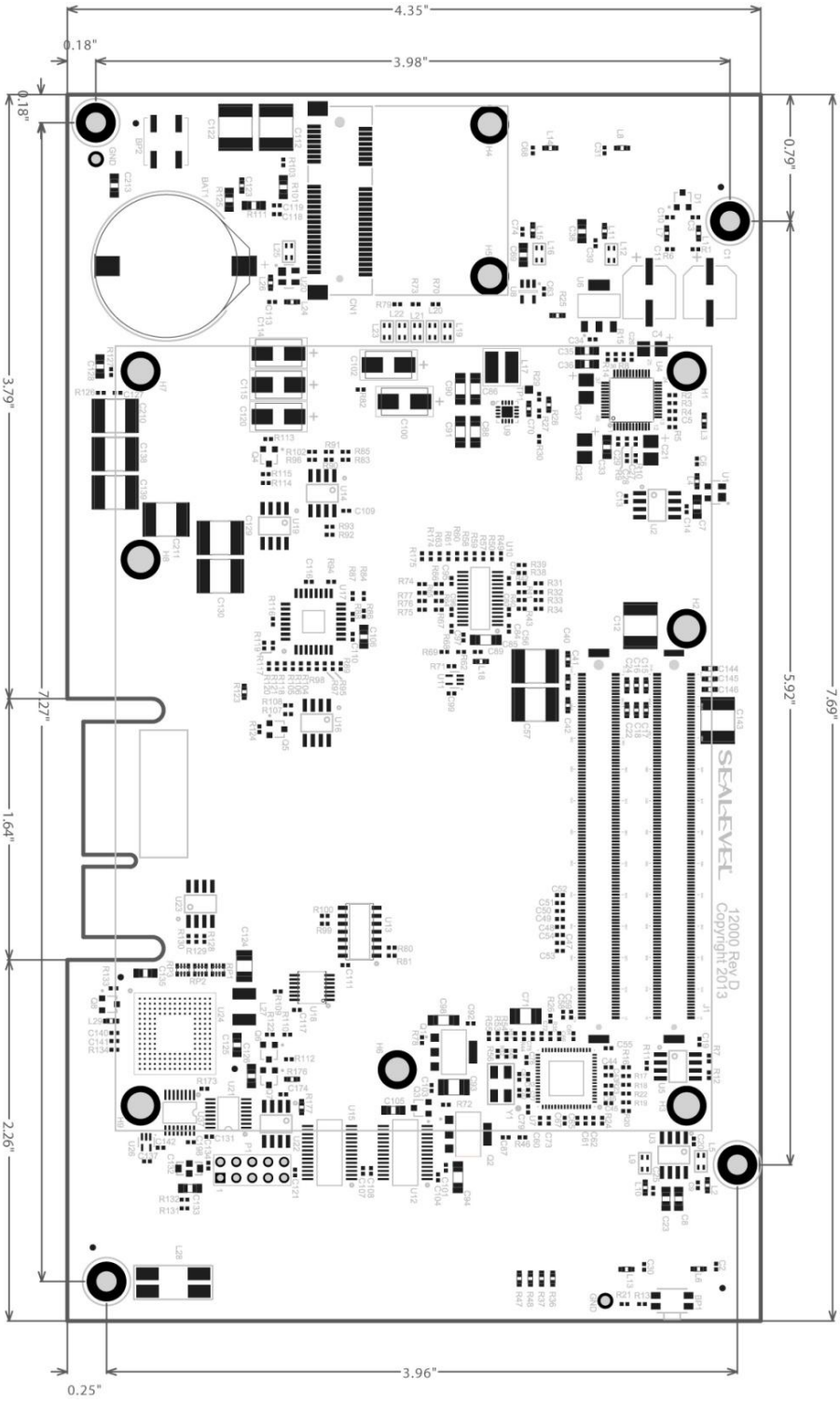


This special bit is called the parity bit. Parity is a simple method of determining if a data bit has been lost or corrupted during transmission. There are several methods for implementing a parity check to guard against data corruption. Common methods are called (E)ven Parity or (O)dd Parity. Sometimes parity is not used to detect errors on the data stream. This is refereed to as (N)o parity. Because each bit in asynchronous communications is sent consecutively, it is easy to generalize asynchronous communications by stating that each character is wrapped (framed) by pre-defined bits to mark the beginning and end of the serial transmission of the character. The data rate and communication parameters for asynchronous communications have to be the same at both the transmitting and receiving ends. The communication parameters are baud rate, parity, number of data bits per character, and stop bits (i.e., 9600,N,8,1).

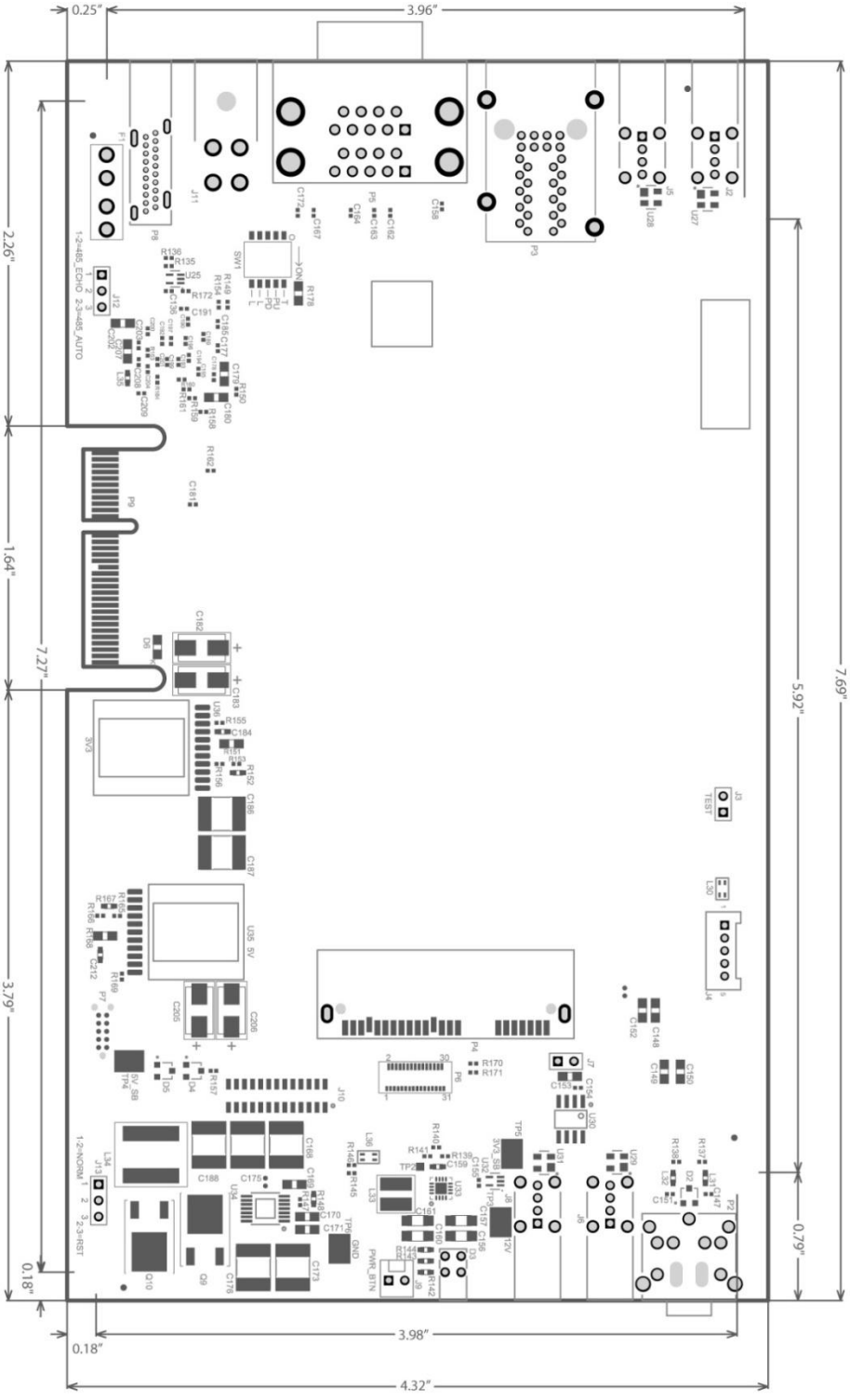
Appendix D - Mechanical Drawing

Top Side

All dimensions are in thousands of an inch (mils).



Bottom Side



Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured I/O products. Relio™ industrial computers are warranted for a period of two years and the R9 family is warranted for a five year period from date of purchase. We are able to offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing. Sealevel achieved ISO-9001:2008 certification in 2011.

Warranty Policy

Sealevel Systems, Inc. (hereafter "Sealevel") warrants that the Product shall conform to and perform in accordance with published technical specifications and shall be free of defects in materials and workmanship for the warranty period. In the event of failure, Sealevel will repair or replace the product at Sealevel's sole discretion. Failures resulting from misapplication or misuse of the Product, failure to adhere to any specifications or instructions, or failure resulting from neglect, abuse, accidents, or acts of nature are not covered under this warranty.

Warranty service may be obtained by delivering the Product to Sealevel and providing proof of purchase. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Sealevel, and to use the original shipping container or equivalent. Warranty is valid only for original purchaser and is not transferable.

This warranty applies to Sealevel manufactured Product. Product purchased through Sealevel but manufactured by a third party will retain the original manufacturer's warranty.

Non-Warranty Repair/Retest

Products returned due to damage or misuse and Products retested with no problem found are subject to repair/retest charges. A purchase order or credit card number and authorization must be provided in order to obtain an RMA (Return Merchandise Authorization) number prior to returning Product.

How to obtain an RMA (Return Merchandise Authorization)

If you need to return a product for warranty or non-warranty repair, you must first obtain an RMA number. Please contact Sealevel Systems, Inc. Technical Support for assistance:

Available	Monday – Friday, 8:00AM to 5:00PM EST
Phone	864-843-4343
Email	support@sealevel.com

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